Organometallics 2014 vol.33 N18, pages 4574-4589

Electrochemical synthesis and properties of organonickel σ-complexes

Yakhvarov D., Khusnuriyalova A., Sinyashin O.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2014 American Chemical Society. The organonickel complexes are organometallic compounds containing a Ni - C σ-bond (σ-complexes). These species are very reactive and have been mainly characterized as the intermediates of catalytic processes of cross coupling and homocoupling involving organic and elementoorganic substrates such as organic halides, chlorophosphines, unsaturated hydrocarbons, etc. Thus, only a limited number of these complexes have been isolated and characterized as the free stable species. Although the organonickel complexes have been known since the 1960s, the chemistry of these species is currently at the beginning stages of development. The interest of the researchers in this class of compounds has significantly increased over the past decade, resulting in a plethora of scientific papers published on this topic. At the same time, electrochemical methods have become more and more popular in modern synthetic chemistry, due to easy access to high reactive intermediates, including organometallic species, which can be selectively generated in situ and used for subsequent synthetic processes. This review summarizes the elaborated electrochemical approaches for the preparation of organonickel complexes, including a discussion of the important role of the electrochemical cell construction and the influence of the electrode material nature on the electrochemical process. In order to give more insight into the importance of organonickel complexes in synthetic chemistry and introduce the reader to this problem of organometallic chemistry, focused on the development of new synthetic protocols for preparation of stable organonickel complexes, an overview of the most important catalytic processes proceeding with participation of these highly reactive intermediates and the main types of organonickel complexes are presented. However, in this review organonickel complexes will be limited by examples in which the organic fragment is singly bonded to the nickel center, because these species are responsible for the catalytic reactions.

http://dx.doi.org/10.1021/om500100q